

The orange, yellowish, or whitish suffusion at the base of the lunules, which is often brilliant in the type, disappears in these specimens altogether, the borders then reminding somewhat of the wing-borders in *V. io*.

(To be continued.)

SOME EUROPEAN FOSSIL BEES.

BY T. D. A. COCKERELL.

WHEN recently in Zürich I took the opportunity to make a critical examination of a number of fossil bees described by Heer from the Miocene of Eningen.* For every facility in this work I am indebted to the kindness of Professor Albert Heim, in whose custody the collections are. The splendid collection of fossil insects at the Zürich Polytechnicum would afford opportunity for many months of fruitful study, and it is much to be regretted that it has been, and is so greatly, neglected by entomologists.

Lithurgus adamiticus (Heer).

Apis adamitica, Heer, Foss. Hym. aus Eningen und Radoboj, p. 4, taf. III. fig. 11. Urwelt der Schweiz, f. 287.

This was described, and has since been cited by authors, as a veritable *Apis*, closely related to the living honey-bee. An examination of the type shows that the resemblance to *Apis* is merely superficial, and, so far as can be seen, the insect essentially agrees with *Lithurgus*. The shape of the abdomen accords well with female *Lithurgus*: the abdomen is a little over 8 mm. long, 4 broad, truncate basally, pointed apically, as preserved warm red-brown with the first three sutures colourless; Heer's figure of the first segment shows the *Lithurgus*-like form. The thorax is short, of the same colour as the abdomen; the legs are not visible. The wings seem short for the size of the insect; the venation is only partly preserved. Marginal cell relatively short, pointed, the end symmetrical, not approaching apex of wing; all this exactly as in *Lithurgus*, and different from *Apis*, or even *Megachile*, the latter having the cell much more obtuse. Stigma slightly developed, as in *Lithurgus*, the part projecting over the marginal cell short, herein like *L. atratiformis*, Ckll.† Basal nervure hardly deflected at the junction of the two sections, and with the upper section relatively long; all this as in *L. atratiformis*, and contrasting with the European *L. fuscipennis*.

* The fossil-beds, cited in all the literature as of Eningen, are actually on the hill above Wangen, and some distance from Eningen. My wife and I visited the place, and collected a series of fossils, but did not obtain any bees.

† Specimens from Tahiti compared.

Basal nervure to base of marginal cell about equal to half length of cell. At first sight one seems to see indications of a third submarginal cell, as figured by Heer, but this is illusory, and is negatived also by the fact that the broad second submarginal receives both the recurrent nervures, the first very near the base, the second some distance from the apex; this differs a little from modern *Lithurgus*, in which the second recurrent is received nearer the apex. The shape of the second submarginal cell also differs from that in living *Lithurgus*, in that it is less constricted above, the second transverso-cubital nervure going more directly to the marginal. Basal nervure meeting the transverso-medial a little on the apical side; it falls distinctly short of it in modern *Lithurgus*.

All things considered, therefore, the Eningen bee must be placed in *Lithurgus*, with the remark that it is somewhat less modified or specialized in venation than the living species. It might possibly be justifiable to distinguish it sub-generically. In Prussian amber, of Oligocene age, there are two extinct genera of bees possessing only two submarginal cells, and probably referable to a group from which the Megachiloids (including *Lithurgus*) sprung. *Glyptapis mirabilis*, Ckll., has a venation not very unlike that of *Lithurgus adamiticus*, but the stigma is relatively long and narrow. This is, however, a little black bee, slightly over 5 mm. long, with *hairy eyes*, mandibles with a broad cutting edge notched near the apex, metathorax divided by ridges into large subquadrangular areas. The hairy eyes of *Glyptapis* are especially interesting, because this character exists to-day in the parasitic Megachiloid genus *Cœlixys*. (In the African * *C. decipiens*, Spin., the eyes are naked however.) In the other amber genus referred to the eyes are bare. *Ctenoplectrella viridiceps*, Ckll., is a small stout bee like *Glyptapis*, hardly 5 mm. long, claws strongly cleft, pulvillus large, malar space very short, wings dark rufo-fuliginous, stigma large, second submarginal cell receiving first recurrent nervure some distance from base, and second not far from apex. These amber bees, and many others which I have described, are in the museum at Königsberg, where a full account of them is in process of publication. All of the Prussian amber bees, so far as seen by me, are of extinct genera; but the Miocene bees, whether of Europe or America, include various living genera.

Xylocopa abarus (Heer).

The "type" is a bee with a broad thorax; no head or abdomen visible, and the venation cannot be made out. The legs show a scopa, and the hind tibia is very broad, with a gently curved longitudinal ridge visible on both sides, and,

* Specimen from Willowmore, Cape Colony (*Brauns*).

therefore, certainly natural. This ridge is normal for *Xylocopa*, to which the *Bombus abavus*, Heer (*tom. cit.*, p. 5), must apparently be referred. The only doubt arises from Heer's figure, which represents a similar-looking object, but with head and abdomen. The Zürich specimen may therefore not be the true type.

Another *Xylocopa* (*X. scuilis*, Heer) has been described from Æningen. The type appears to be at Karlsruhe, and I did not see it.

Xylocopa jurinei (Heer).

Bombus jurinci, Heer, *tom. cit.*, p. 4, taf. III. fig. 8.

The type is a very large and stout-bodied bee, like a *Bombus*. Head lacking, abdomen 12 mm. wide, hind legs with a coarse scopa, marginal cell with a dark cloud. Only part of the venation can be made out, but all that can be seen agrees with *Xylocopa*, and not with *Bombus*. The second recurrent nervure can be seen entering the third submarginal cell far from its end, and the shape of the cell (base and extreme apex not visible) is as in *Xylocopa*. The lower side of the cell is arched before the insertion of the recurrent nervures, as in *X. violacea*. The apical part of the second discoidal cell can also be seen, exactly as in *Xylocopa*. There is also visible a considerable part of the venation of the hind wing, showing the transverso-cubital, and the ends of the marginal and cubital nervures, quite as in *Xylocopa*.

Anthophorites titania (Heer).

Scutellum broad and flat; mesothorax rather small; metathorax with apparently a sharp edge separating base from apical truncation; head absent; first abdominal segment narrowed basally, the abdomen broadest at middle of third segment; stigma narrow, rather well-developed; upper section of basal nervure shorter than lower; marginal cell sharply pointed, rather broad basally; rest of venation cannot be made out.

The specimen here described is supposed to be the type, but it is evidently not the one figured by Heer. The species was described from two specimens from Æningen in the Karlsruhe collection; perhaps the one now at Zürich is one of them. The genus *Anthophorites* cannot be precisely defined, but includes various fossil bees supposed to be more or less similar to *Anthophora*. I herewith designate Heer's first species, *A. mellona*, as the type.

The generic position of *A. titania*, at least as exemplified by the Zürich specimen, remains obscure.

Anthophorites longæva, Heer.

♀. Clearly a bee; eyes large; face narrow; middle joints of the rather stout flagellum a little longer than broad; abdo-

men with fine hair, and broad at base, not at all like the specimen of *A. titania*; hind tibia $3\frac{3}{4}$ mm., hind basitarsus about $2\frac{1}{2}$ mm.; hind basitarsus broadened; venation cannot be made out. The generic position of this specimen must remain wholly obscure.

A. longæva was based on two specimens, which, judging from Heer's figures, are probably not even congeneric. The specimen above described is from Æningen, but Heer's first one, from Radoboij, must be considered the true type.

“*Osmia*.”

In 1849 Heer published *Osmia antiqua* from Æningen. This was a poorly preserved insect, which cannot apparently be referred to *Osmia* or any other genus with certainty. In Heer's work, translated and edited by Heywood, 'The Primæval World of Switzerland' (1876), vol. ii. p. 43, I find a statement that there were three species of *Osmia* at Æningen. In the collection at Zürich I find three species from that locality, bearing manuscript names by Heer. One of these, an insect about $9\frac{1}{2}$ mm. long, the abdomen almost 6 mm., shows no venation, and is worthless for descriptive purposes. One is a wasp. The third may be described as follows:—

Andrena (?) *primæva*, n. sp. ♀.

Osmia primæva, Heer, MS. A medium-sized species, with broad subglobose abdomen, clearly a bee. Thorax small; hind legs preserved, showing scopa; three submarginal cells.

The hind legs are robust, formed as in *Andrena*, except that the broad hind femur is swollen above at base; this condition is, however, distinctly approached in some species of *Andrena*. The tibia and broad basitarsus, the latter showing much long hair along its hind margin, are exactly as in *Andrena*. The middle basitarsus is a little longer than the small tibia, and is quite broad, narrowing somewhat toward the base. The form of this basitarsus is rather unusual, but finds a close parallel in *A. hattorfiana* (Fabr.).

The venation, so far as visible, is as follows: stigma long and well-developed, quite normal for *Andrena*; marginal cell quite normal, the apex narrowly rounded, just away from costa, as in *A. morio*; second submarginal cell approximately square, receiving the first recurrent nervure about the middle, as in *A. errans*; third submarginal cell fully twice length of second, but about equally broad on marginal, receiving the second recurrent nervure just before the beginning of the last third; third transverso-cubital with a single curve, not at all angulate; second recurrent nervure normal in form.

The relatively long third submarginal cell suggests *Nomia*, but occurs also in *Andrena*, e. g. *A. albicans*. In the hind wing the marginal, cubital, and transverso-cubital nervures are visible, entirely as in *Andrena*. The transverso-cubital is a little oblique, the lower end most basad.

All things considered, the reference to *Andrena* seems reasonably assured.

Hab.—Miocene rocks at Eningen (*i. e.* Wangen), Baden.

Apis mellifera (L.).

In the Museum of Cambridge University is a piece of amber from the coast off Yarmouth, containing two specimens of genuine *Apis mellifera*, side by side. As preserved, the eyes and ocelli are a fine crimson, evidently from the eye-pigment, and the face and front are a deep metallic reddish, perhaps from a suffusion of the same substance. The basal nervure can be seen falling far short of the transverso-medial, and the other characters of the venation, legs, &c., agree with the honey-bee. The amber, as the museum records show, was purchased in the rough by Benjamin Burwood from fishermen in or near Great Yarmouth. The bees, and other amber insects from the same source, were crudely figured by A. S. Foord in *Trans. Norf. and Norw. Nat. Soc.* vol. v. pt. 1 (1890). The other specimens, also now in the Cambridge Museum, include Coleoptera and Diptera, and a cockroach labelled *Blatta orientalis*, but evidently not that species, and apparently not identical with any living British form. It is well preserved, and should be studied by a specialist in these insects.

Conwentz has given a full discussion of English amber in 'Natural Science,' 1896. Its age has not been precisely ascertained, but if the specimen containing honey-bees is authentic, it must be Pliocene at the oldest, and cannot possibly have anything to do with the true Baltic amber of Oligocene age. Conwentz remarks, however, that much of the succinite in shops at Cromer is imported from abroad in order to satisfy the demand of visitors to the seaside, and from the appearance of the piece containing *Apis*, I cannot help suspecting that it is really copal, and not of English origin at all. Some of the pieces containing beetles seem to be genuine, however, and these should be critically examined.

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NOTES AND OBSERVATIONS.

PUPATION OF XANTHORHÖ (MELANIPPE) FLUCTUATA.—It has been stated that the larva of *X. fluctuata* having made its frail, underground cocoon, postpones the pupal change for a rather long time, perhaps even the entire winter. Some larvæ of this species that I reared last September–October, in a glass tumbler with a little earth at the bottom, formed their cocoons in the soil but against the glass. This method of construction enabled me to see the larva in its cell,